

Article

Exploring the Survival Mechanisms of Short-Term Rentals in Virginia: A Comparative Analysis of Rural versus Non-Rural Markets

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Abstract: This study provides a comprehensive analysis of the survival mechanisms of STRs in Virginia, particularly focusing on rural versus non-rural markets. Utilizing data from AirDNA, we observe 16,852 active listings from 2018 to 2022. The study identifies the influence of various factors on STR longevity, including unit type, location, and the number of bedrooms. It is a unique attempt to bridge the gap in understanding the dynamics of short-term rentals (STRs) in rural and urban contexts. Our findings reveal differences in the survival patterns of STRs in rural versus non-rural markets. In particular, rural STRs exhibit higher survival probabilities compared to their non-rural counterparts. Furthermore, Full-Time STRs, which are primarily dedicated to short-term rentals, show significantly higher survival probabilities than Occasional STRs, regardless of their location. These findings serve as critical inputs for stakeholders involved in policymaking, regulation, and industry strategies. By highlighting the distinctive dynamics of rural and urban STR markets, we underscore the need for context-specific regulations that can balance the economic benefits of STRs with the preservation of local housing options.

Keywords: short-term rentals; rural areas; survival analysis; Airbnb; housing affordability; tourism



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1. Introduction

The rise of short-term rental (STR) platforms such as Airbnb in the past decade has brought about significant changes in the tourism industry. To be specific, these platforms have transformed the way people travel by directly connecting hosts and guests, providing individuals and property owners with the opportunity to offer their homes or spare rooms for short-term stays. This shift has offered a wide range of lodging options to travelers in terms of price and location, allowing travelers to choose accommodations that suit their preferences and budgets [1–4]. This variety has resulted in increased tourism demand and has contributed to the local economy, particularly in rural areas that heavily rely on tourism as a vital source of income and employment. The accessibility and affordability of STRs have attracted tourists who seek unique experiences and a more intimate connection with the local culture and community.

While the growth of the STR market has brought many benefits, it is not without its challenges and controversies. Urban centers and their outskirts have seen the brunt of some of these challenges with issues like transportation congestion, limited parking spaces, concerns about property maintenance, safety [5,6], gentrification [7,8], and the phenomena of overtourism [9,10]. These latter challenges, particularly gentrification and overtourism, pose additional concerns as neighborhoods transform, often displacing long-standing communities and straining local resources and infrastructure. Moreover, the broader implications of STRs on housing dynamics cannot be overlooked. There's substantial evidence that the boom in STRs can influence rental prices, potentially inflating them in some areas [11,12]. Such a trend can decrease the availability of long-term rental housing,

creating a ripple effect on housing affordability and potentially leading to the displacement of long-term residents [8,13,14].

Rural areas have uniquely experienced both the benefits and challenges of this STR evolution, and the COVID-19 pandemic has further highlighted the significance of short-term rentals, especially in rural areas. As travelers sought alternatives to crowded hotels and urban centers, rural destinations emerged as popular choices due to their natural beauty, open spaces, and perceived safety [15]. In the United States, domestic bookings for rural accommodations on Airbnb—one of the most representative platforms of STR—experienced an astounding 110% increase compared to 2019, and Airbnb hosts in rural counties accumulated over \$3.5 billion in revenue within three years [15]. These numbers demonstrate the significant economic impact of STRs on rural communities in which tourism is a significant part of the local economy [16].

The growth of the STR industry in rural areas underscores a need for understanding its dynamics. Although previous research has examined several aspects of the STR phenomenon, including its economic contributions to rural revitalization and the creation of new tourism markets [16,17], the survival mechanisms of rural STRs remain less explored. This study, one of the first of its kind, seeks to fill this research gap. Focusing on Virginia in the US, we utilize data from AirDNA, encompassing 16,852 active listings from 2018 to 2022. This allows us to investigate the STR market's trends and dynamics over these years. Specifically, we aim to compare the survival patterns between rural and urban STRs, analyzing factors such as STR type and bedroom size. Crafting policies that ensure the sustainable growth of STRs requires in-depth insights into their survival mechanisms. By uncovering the factors influencing STR longevity, we can offer policymakers the tools they need to make decisions regarding regulations, zoning, and taxation. Balancing the economic advantages of STRs with concerns like housing availability and affordability becomes paramount, and this research serves as a foundation for such endeavors.

Our findings reveal that both rural and non-rural areas in Virginia have witnessed substantial growth in the STR market, even amidst the COVID-19 pandemic. The survival analysis indicates that rural STRs have a higher survival probability compared to non-rural STRs, suggesting a more stable and sustainable market in rural regions. These findings emphasize the need for context-specific regulations that balance the economic benefits of STRs with concerns about housing availability and affordability. The factors identified as influencing STR survival, such as STR type, rating, and location, can be leveraged to formulate regulation, targeted support programs and incentives, enhancing the overall sustainability and competitiveness of the rural STR market.

2. Literature Review

2.1. Short-Term Rentals (STRs): An Evolving Landscape

Short-term rentals offer travelers a unique value proposition, combining cost benefits, residential comforts, and a more authentic local experience [18]. Unlike traditional accommodations, STRs frequently pop up in a variety of locations, particularly near transport hubs and tourist attractions. This geographical flexibility channels tourism revenue into areas previously overlooked by tourists [1–4]. Consequently, a more decentralized travel ecosystem is emerging as STRs grow in popularity in both core and peripheral areas, diverging from the dominance of traditional accommodations like hotels [9,10,19]. For hosts, STRs present both financial and experiential rewards. Hosting can supplement income, reduce personal expenses, and offer a chance to connect with a global audience. This environment fosters sharing and cultural exchange, enriching the host's life experiences [20,21]. However, the proliferation of STRs is not without its challenges. Their growth has intensified touristification, especially in bustling city centers [22,23], and led to the gentrification of regions previously untouched by tourism [7,8]. With STRs now outpacing traditional lodgings, concerns over overtourism emerge, particularly as tourists venture deeper into traditional residential areas [9,10]. This growth in STRs affects urban dynamics, too. As residential properties transform into STRs, housing availability for local residents

shrinks, exacerbating depopulation concerns [24]. While overtourism previously concerned mainly natural reserves, today's urban centers are the new focal points requiring revised management strategies [25,26].

2.2. Economic Impacts and Challenges

The growing popularity and expansion of Short-Term Rentals (STRs) have initiated ripple effects across various economic aspects of cities around the world. A significant area of interest is their influence on local property markets. A body of research illustrates a direct link between the proliferation of STRs and the upward pressure on property prices and rents. Sheppard and Udell and Garcia-López et al. have provided evidence that in cities where STR platforms have grown rapidly, there has been a noticeable escalation in both property prices and rental values [12,13]. Another facet of the STR economic debate is the issue of housing affordability. As more properties are converted into STRs, locals often find it increasingly challenging to find affordable rental options. Concerns over the widening rental gap and potential displacement of long-term residents have been highlighted in works by Simcock, Amore et al., and Lee [27–29]. The narrative of gentrification and “touristification” becomes especially poignant when platforms like Airbnb extend their reach beyond typical tourist areas and into the heart of traditional residential neighborhoods. Sequera and Nofre underscore that this shift has sometimes resulted in tensions between locals and short-term renters, leading to calls for regulatory interventions [24]. On the brighter side, the rise of STR platforms is not without benefits for the local communities. Inclusive tourism, where visitors engage more authentically with local cultures and economies, can be facilitated by platforms like Airbnb. Kadi et al. discuss how community-driven initiatives, backed by STR platforms, have empowered local residents, offering them alternative sources of income and avenues for cultural exchange [30]. Nevertheless, it is crucial to understand that while STR platforms often market themselves as champions of the ‘sharing economy’, a significant portion of the STR market is not necessarily ‘shared’ by typical homeowners. Findings from Mermet and Wachsmuth and Weisler indicate that a dominant segment of STRs, particularly in major cities, is managed by commercial entities or hosts with multiple listings [8,31]. This commercialization underscores the need for a balanced approach in regulation to ensure that the benefits of STRs are widespread and not concentrated in the hands of a few.

2.3. Competition with Traditional Lodging Industry

The relationship between Short-Term Rentals (STRs) and hotels continues to be a topic of debate and intrigue within the hospitality sector. As platforms like Airbnb have gained prominence, the traditional hotel landscape has been compelled to respond, sometimes in unexpected ways. From an economic perspective, the effects of STRs on hotel revenues and rates have been varied. Studies from Zervas et al. and McGowan and Mahon suggest that the rise of the STR market has led certain hotels, especially those in the budget category, to reevaluate and often reduce their prices [32,33]. This is likely due to an increased supply of accommodations and a shift in traveler demand towards more diverse and competitively priced lodging experiences. However, research by Choi et al. and Blal et al. posits that traditional hotels, particularly the more established ones, have remained relatively unaffected, with only minor impacts on their revenue streams [34,35]. Examining the traveler's mindset provides further insights. Guttentag and Smith propose that the appeal of STRs is not solely based on price [36]. Many Airbnb users, they argue, might prefer mid-range hotels if platforms like Airbnb were not available. This suggests that travelers are not just seeking cost-effective options but also unique and localized experiences, which STRs often provide better than conventional hotels. Hoteliers' perceptions of STRs add another layer to this complex discussion. While it might be assumed that traditional hotels would view Airbnb and similar platforms as direct competitors, findings from Koh and King, and Varma et al. indicate otherwise [37,38]. Not all hotel representatives see STRs as direct competitors. Some view them as a different segment within the broader

hospitality ecosystem, catering to different traveler needs and preferences. This viewpoint suggests that while STRs might cater to travelers wanting genuine, homely experiences, traditional hotels still attract those who prioritize consistency, full-service amenities, and professional hospitality.

2.4. Rural STRs: A Fresh Perspective

While much of the conversation around STRs has centered on urban settings, rural STRs present a compelling narrative. An Airbnb report pointed out the platform's substantial contribution to rural revitalization and economic development [16]. The rapid growth of Airbnb in rural areas, exceeding urban growth rates in countries like Latin America and Japan, presents new economic opportunities for rural hosts, particularly women, and enhances the diversity of the rural tourism landscape. Hübscher et al. focused on Airbnb's potential of creating new tourism markets beyond the existing accommodations in Santa Cruz de Tenerife, particularly in natural and rural spaces [17]. This growth signifies a shift in tourism trends, with tourists increasingly seeking unique experiences in less crowded and nature-rich environments. While these findings present a positive economic impact, it is also crucial to consider the broader implications on the social and cultural dynamics in these communities. Combs et al. conducted a comprehensive analysis of STRs in Canada, revealing a significant growth in active listings, revenue, hosts with multiple listings, and the rental of entire homes in small towns and rural regions [39]. This highlights the rising popularity and economic significance of rural STRs and emphasizes the importance of understanding their unique attributes and dynamics. Falk et al. examined the determinants of Airbnb accommodation prices in both rural and urban areas in Switzerland from 2016 to 2018 [40]. Their empirical analysis incorporated 40 measurable attributes listed in the title description. Their findings indicated that luxury and penthouse features greatly influenced pricing, enabling a price increase of 20–70% based on location and price tier. They also found other high-value attributes, such as chic & designed, duplex, sauna, Jacuzzi & Spa, suite, and unique, in the title that were associated with higher prices. However, the impact of these attributes on pricing varied across locations. Their study demonstrated that the relevance of certain quality attributes was more significant for high-priced listings than for lower-priced accommodations.

As STRs continue to evolve, so must the regulatory environment of rural municipalities. Policymakers need to find a delicate balance between encouraging economic growth and preserving community interests, including housing affordability, noise and traffic disturbances, and potential cultural erosion caused by the growth of STRs [41]. Cors-Iglesias classified rural municipalities in Catalonia in Spain based on the volume and growth of peer-to-peer (P2P) accommodation supply [42]. This research identified different types of rural areas experiencing varying levels of growth and diversification in rural tourism, including popular tourism hotspots and previously untapped areas with a strong agricultural presence. Lastly, the COVID-19 pandemic has inevitably affected the STR market. Filieri et al. noted a shift in consumer preferences toward P2P accommodations in rural areas [43]. This trend could be seen as a reflection of the increased value placed on space and privacy during the pandemic. It also highlights the STR market's resilience and adaptability in the face of global crises. However, the long-term implications of this shift warrant further investigation.

Taken together, STRs have revolutionized the travel and accommodation industry over the past years. While they have brought significant economic benefits, they've also given rise to a myriad of socio-urban challenges. Most research to date has primarily focused on the impacts of STRs in urban environments, leaving a relative void in in-depth studies pertaining to the viability and sustainability of STRs in rural settings. Our research aims to bridge this gap by examining the differences in the survival rates of STRs between urban and rural areas. This exploration seeks to shed light on the conditions under which STRs can sustain long-term, and the potential risks or opportunities that lie therein. Ultimately,

the goal of this study is to identify key factors that play a pivotal role in the survival and sustainability of STRs across both urban and rural settings.

3. Classification of Short-Term Rentals (STRs)

The understanding and categorization of Short-Term Rentals (STRs) is crucial in effectively analyzing their impacts on various elements, predominantly the housing market. This is because the STR effects can significantly diverge based on whether a property is entirely dedicated to short-term rentals or if it serves as the host's primary residence with a fraction rented out. Proper classification allows for a comprehensive analysis of these effects and enables the development of appropriate regulations. Previous research, such as the studies conducted by Furukawa and Onuki and Combs et al., has made attempts to classify STRs [39,44].

Furukawa and Onuki's classification approach leaned on the host's occupancy status and whether the rental was operated in their primary residence [44]. They identified the following three types:

- **Primary Hosted STRs:** These rentals are operated in the primary residence of the host, with the host staying at home during the guests' stay. Only a part of the home is offered to the guests.
- **Primary Unhosted STRs:** These rentals are operated in the primary residence of the host, but the host is absent, and the entire home is rented to the guests.
- **Nonprimary STRs:** These rentals take place in properties other than the host's primary residence, including second homes and properties used for commercial purposes.

Combs et al. focused on the potential conversion of long-term housing units to STRs. Their categorization of STRs centered around occupancy rates, active status, and if the entire home was rented out [39]. They identified two main types:

- **Frequently Rented Entire-Home Listings (FREH):** These listings were available for rent for at least 120 nights last year and rented for at least 60 nights.
- **Very Frequently Rented Entire-Home Listings (VFREH):** These listings were available for rent for at least 240 nights last year and rented for at least 120 nights.

In this study, we employ a classification strategy similar to Combs et al. but with a distinct emphasis. Rather than focusing on performance indicators such as revenue and occupancy rate, we prioritize the active status of the listings. This decision stems from the possibility that new and rapidly emerging STRs could be inaccurately classified if assessed solely on financial performance. For example, new STR units typically require an average of four weeks to secure their initial booking, ushering in a period of revenue stabilization [15]. As a result, newly listed units might initially be classified as inactive STRs due to lower occupancy rates or delayed revenue generation. Moreover, this strategy is directly linked to potential implications for the housing market. The active status indicates whether the property contributes to the housing market inventory, regardless of its popularity or revenue. This focus on the active status rather than financial performance indicators provides a clear perspective on the impacts of STRs on the housing market. This focus on the active status rather than financial performance indicators provides a clear perspective on the impacts of STRs on the housing market. The proposed classifications are as follows:

- **Full-Time STRs:** These are properties wholly dedicated to short-term rentals, and the entire home/apartment is rented out. They maintain an active listing status throughout the year. This full dedication to the STR market may potentially reduce housing availability for long-term rentals (LTRs), influencing housing affordability.
- **Occasional STRs:** These are properties that intermittently operate as short-term rentals. Here, the entire home/apartment is rented out, but they maintain an active listing status only for a period of at least one month within a year. Property owners typically utilize these spaces for STRs when they are not personally occupying them. Although these properties do not entirely serve the STR market, their periodic use as STRs makes them unavailable for the LTR market during their active periods.

- **Partial STRs:** These properties involve only a portion of the home being listed as an STR, with an active listing period of at least one month within a year. They are categorized as “Private Room” or “Shared Room” listings. While they may cause minor inconveniences to neighbors, they generally have a lesser impact on housing affordability.

Our classification of STRs that considers the active status of the listings is an important step in evaluating their multifaceted impacts, especially on the housing market. We believe this perspective, although diverging from a purely financial focus, allows for a more thorough understanding of STRs influence on housing availability and affordability that has been rarely explored. By defining STRs as Full-Time, Occasional, or Partial, we can better examine the dynamics of the STR market, considering the continuous growth of these rentals, particularly in rural areas.

4. Data and Methodology

4.1. Data Source

The primary data source in our study is AirDNA, a leading global firm specializing in short-term rental (STR) data analytics. AirDNA aggregates STR listing data from multiple online platforms, most notably Airbnb and Vrbo. The method by which AirDNA collects this data is through a process known as web scraping. This technique allows for the systematic extraction of large amounts of data from the web. These data collection efforts occur daily, capturing snapshots of all available STR listings at any given point. This frequent data collection provides a continuously updated and accurate representation of the STR market. Several studies on STRs have relied on data directly scraped from Airbnb.com [3,11] or obtained from third-party data scrapers such as InsideAirbnb [12,45], or indeed, AirDNA [8,14]. This practice of utilizing data procured from third-party sources has gained popularity primarily due to the considerable reduction in data collection time it offers. The reliability of this third-party scraped data has been the subject of scrutiny in the academic community. Studies that cross-verified the reliability of data using two distinct data sources [28,45] have affirmed the accuracy of the data obtained via third-party scraping methods. Consequently, the utilization of data from third-party sources such as AirDNA is considered to be a reliable method of sourcing STR data, as validated by previous research. Therefore, AirDNA provides a robust and reliable data source for our study.

4.2. Methodology

This study aims to compare the survival mechanisms of short-term rentals (STRs) in rural/small cities and non-rural areas in Virginia in the US, shedding light on the distinctive characteristics of the rural STR market. While existing research has extensively explored the growth, pricing determinants, and regulations within the STR market, our study specifically focuses on the survival of STR units. Past studies have frequently centered around guests' viewpoints, often sidelining the concerns of hosts in P2P accommodation platforms. But from the vantage point of hosts, sustained market presence is a paramount concern. Various research has tried to demystify the aspects influencing Airbnb listing survival [46–48]. These studies have unveiled crucial determinants, such as listing size (e.g., number of guests and rooms) [47], accessibility and market saturation [46], specific traits of tourist destinations [48], and managerial practices [47]. Moreover, Leoni, exploring Airbnb listing data, stressed the significance of attributes like listing features, local rivalry, and host management expertise on a listing's longevity [49]. This analysis also suggested that subpar listing quality could lead to its eventual disappearance from the platform. We investigate whether the effects of unit characteristics, such as STR type and bedroom size, on survival differ based on the location. Virginia, with its diverse geographic features encompassing not only metropolitan areas like the Washington-Arlington-Alexandria MSA but also coastal regions and scenic mountainous areas such as Shenandoah, serves as an ideal case study for our research. It is important to note that, for the purpose of this study, we have excluded partial STRs from our analysis. Partial STRs, characterized by extremely

low volume and high volatility, were deemed to have minimal impact on the housing market and were thus excluded.

To examine the duration of unit survival, we employ survival analysis in this study. It is important to note that failure events, often perceived negatively, do not solely indicate unfavorable outcomes in this context. In fact, higher survival rates may indicate that units converted from long-term rentals to STRs are not returning to the long-term rental market [49]. In other words, their survival indicates that the units are not serving permanent residents or local residents in the local housing market. Therefore, understanding the nature of these failure events is essential for developing effective regulation or promotion strategies. In this sense, we conduct survival analysis to examine the duration of unit survival and understand the factors that influence the survival of short-term rentals (STRs) in the market.

The survival function, denoted as $S(t)$, represents the probability of surviving beyond a given time point t . It is defined as:

$$S(t) = P(T > t) \quad (1)$$

The hazard function, denoted as $h(t)$, represents the instantaneous risk of an event occurring at a specific time t . It is defined as the probability of an event occurring within a small-time interval divided by the length of that interval. The hazard function can be expressed as:

$$h(t) = \lim_{\Delta t \rightarrow 0} \frac{P(t \leq T < t + \Delta t \mid T \geq t)}{\Delta t} \quad (2)$$

The core of our model is Equation (3), which essentially builds on the foundation of Cox Proportional Hazards Model. This model is widely acclaimed in the literature for its flexibility in dealing with censored data and its ability to introduce multiple variables [50]. The chosen model allows us to determine the baseline hazard function and incorporate time-independent covariates that may impact the survival probability. In our analysis, the hazard function is modeled as follows:

$$h_i(t) = h_0(t) * \exp(\beta_0 + \beta_1 Rural_i + \beta_2 UnitC_i + \beta_3 Rural_i * UnitC_i + \beta_4 CountyFE_i) \quad (3)$$

Here, $h_i(t)$ represents the hazard function for individual unit i at time t . The baseline hazard function $h_0(t)$ captures the risk of dropout from STR market for a unit with all predictors set to zero. $Rural_i$ is a binary variable indicating whether individual unit i is located in a rural/small city. The dataset provided by AirDNA includes a location type variable, which classifies areas into six categories based on not only the size and nature of the city but also attractions like beaches, mountains, or lakes that attract guests to the area. These categories are large city-urban, large city-suburban, midsize cities, Coastal, Mountain/Lake, and rural/small city. As reported in Appendix A, out of the 133 counties or county equivalents in Virginia, 93 are classified as rural/small cities.

The unit characteristics, represented by $UnitC_i$, encompass various factors such as whether the unit is a full-time short-term rental (Full-Time STR), the number of bedrooms, the price tier, the rating, and the minimum stay. Full-Time STRs are properties that have remained in an active state, available for short-term rental as an entire home, throughout the entire 12-month period. However, some units may experience fluctuations between being classified as full-time STR and occasional STR. These units may transition between operating as full-time STR for certain periods and temporarily switching to occasional STR status for other periods. In our study, we consider any unit that has been a full-time STR at least once during the analysis period as a Full-Time STR. The price tier variable categorizes units into Budget, Economy, Midscale, Upscale, and Luxury tiers based on the performance of their average daily rate over the last 12 months. Each price tier is evenly segmented based on the number of listings in the market. For example, in a market with 100 properties, each tier would consist of 20 listings, with the lowest performing listing ranked as 1 and the highest performing as 100. The rating variable is categorized into three groups: 96–100, 91–95, and 90 or below. STRs that have recently entered the market may

not have a rating, and they are treated as having a rating of 90 or below. As our main objective is to examine the variations in mechanisms between rural and non-rural areas, we incorporate interaction terms in the hazard function to explore the combined effects of rural location and unit characteristics. Additionally, the county fixed effect is included to capture county-specific conditions. It takes into account the distinctive characteristics of each county's housing market, the level of activity in the tourism industry, and, importantly, the regulations pertaining to short-term rentals that differ across counties. By including the county fixed effect, we control these factors and better understand their impact on the survival of units in the STR market.

4.3. Analysis Period and COVID-19 Pandemic

For our analysis, we utilize the Virginia listings from 2018 to 2022 obtained from AirDNA. This dataset encompasses a substantial period, allowing us to examine the trends and dynamics of the short-term rental market over several years. One concern is the occurrence of the COVID-19 pandemic during the analysis period. According to the literature, the effects on the STR market varied across regions, with rural areas even experiencing positive effects [43,51,52]. To account for the pandemic's influence, we construct an entry–exit table of annually rented entire home listings. We included any listing that remained active at least once within a year. Contrary to expectations, the number of STRs in Virginia has consistently grown, aligning with pre-pandemic trends. Table 1 presents the survival and entry of STRs in both rural/small city and non-rural settings over the period of study. The columns indicate the number of STRs that survived (continued to be active), the number of STRs that failed (became inactive), the number of new entries, and the balance, or the total active STRs at the end of the period. For instance, looking at the second row (Period 1, April 2018~March 2019), in rural and small city settings, out of the 4557 STRs active at the start, 4501 survived, 56 failed, and there were 2300 new entries. Therefore, the balance of STRs active at the end of the period was 6801.

Table 1. Survival and Entry of STRs.

Period	Rural and Small City					Non-Rural				
	Survive	Failures	Entries	Balance	Growth Rate (%)	Survive	Failures	Entries	Balance	Growth Rate (%)
0 April 2017~March 2018	-	-	-	4,557		-	-	-	12,295	
1 April 2018~March 2019	4501	56	2300	6801	49.2	7668	4627	5158	12,826	4.3
2 April 2019~March 2020	5298	1503	2801	8099	19.1	9211	3615	5900	15,111	17.8
3 April 2020~March 2021	6364	1735	2127	8491	4.8	10,678	4433	7124	17,802	17.8
4 April 2021~March 2022	6564	1927	3227	9791	15.3	11,616	6186	8452	20,068	12.7
5 April 2022~March 2023	7997	1794	4707	12,704	29.8	12,923	7145	10,548	23,471	17.0

Both rural and non-rural areas in Virginia experienced an increasing trend in the number of STRs over the analyzed period, indicating overall growth in the STR market. Interestingly, the number of active listings in Virginia showed continued growth even after the onset of the pandemic, surpassing previous trends. However, there are notable differences between rural and non-rural areas.

In rural areas, the growth has been particularly pronounced in recent periods, specifically from Period 4 to Period 5. On the other hand, non-rural areas have exhibited a more consistent growth trend. Additionally, the survival rates, i.e., the proportion of STR units operating in the current period that were also active in the previous period, are higher in rural areas, hovering around 80%, while non-rural areas exhibit a lower rate of under 70%. Conversely, non-rural areas show a higher influx of new units, with new entries accounting for approximately 40% of the total balance, compared to around 32% in rural areas.

These findings suggest that the rural STR market demonstrates relatively lower volatility, with a higher rate of unit retention and lower entry and exit rates compared to the non-rural market. The rural market appears to exhibit a more stable and sustainable environment, while the non-rural market shows higher dynamism with a greater influx of

new units. Our focus shifts to units that have demonstrated ongoing operation rather than considering the potential disruptions caused by new entries. While new entries may introduce some level of uncertainty, our primary interest lies in understanding the distinct dynamics of the STR market through the survival of units that have been consistently operational. The survival analysis model allows us to observe and analyze units that have been in operation over multiple periods, enabling us to identify robust factors that influence survival.

5. Results

In our survival analysis, we examine the characteristics of the 16,852 entire home short-term rentals (STRs) that were active during Period 0 (April 2017~March 2018). Table 2 presents a comparison of various characteristics of short-term rentals (STRs) between rural and non-rural areas during the entire study periods. Survival Time refers to how long STRs remained active. A survival time of five means the units were active throughout the entire observation period. STRs in rural areas tend to survive longer. Rural areas had a significantly higher proportion of STRs with a survival time of five periods, at 36.5%, compared to 26.1% in non-rural areas. This indicates that housing units in rural areas were serving tourists rather than local or potential residents. The distribution of bedroom sizes varied between rural and non-rural areas. In rural areas, 22.4% of the observed STRs had 0–1 bedroom, while in non-rural areas, the percentage was higher at 32.8%. For units with two bedrooms, the percentages were similar in both rural (24.0%) and non-rural (28.4%) areas. However, rural areas had a higher proportion of STRs with three bedrooms (25.6%), compared to 17.6% in non-rural areas. Similarly, for units with four or more bedrooms, rural areas had a higher percentage of 27.9%, compared to 20.7% in non-rural areas. The distribution across price tiers was relatively similar between rural and non-rural areas. The majority of STRs in both rural and non-rural areas had a rating of 96–100. In rural areas, 62.2% of the observed STRs had a rating of 96–100, while in non-rural areas, the percentage was slightly lower at 45.4%. The proportion of STRs with different minimum stay requirements also exhibited variations between rural and non-rural areas. The percentage of STRs with a minimum stay requirement of one night was similar in both rural (28.8%) and non-rural (28.7%) areas. However, for a minimum stay of two nights, rural areas had a higher percentage of 50.3%, compared to 32.0% in non-rural areas. For minimum stay requirements of 3–6 nights, rural areas had a lower proportion of 15.0%, while non-rural areas had a higher percentage of 25.7%. Finally, for a minimum stay of seven or more nights, rural areas had a lower percentage of 5.9%, while non-rural areas had a higher proportion of 13.6%.

The Kaplan–Meier survival estimates shown in Figure 1 were plotted to visualize the survival functions by location (rural vs. non-rural) and STR type (Full-Time vs. Occasional). The key finding from the analysis is that STR type and locational settings plays a crucial role in determining the survival probabilities. Full-Time STRs consistently exhibit higher survival probabilities compared to Occasional STRs throughout the observation period. This holds true for both rural and non-rural areas. Furthermore, the analysis reveals that the differences in survival probabilities between rural and non-rural areas—which exhibit a higher rate of survival in rural areas—are more pronounced for Full-Time STRs. Full-Time STRs located in rural areas demonstrate higher survival probabilities compared to other categories. On the other hand, the survival probabilities of Occasional STRs show minimal differences between rural and non-rural areas.

Table 2. Descriptive Statistics.

		Rural		Non-Rural	
		Obs.	Percentage	Obs.	Percentage
Survival Time	1	1277	21.9%	3406	30.9%
	2	1055	18.1%	2210	20.0%
	3	695	11.9%	1389	12.6%
	4	578	9.9%	1146	10.4%
	5	2127	36.5%	2879	26.1%
	Full-Time STR	2574	44.2%	3263	29.6%
Bedroom	0–1	1304	22.4%	3621	32.8%
	2	1400	24.0%	3192	28.9%
	3	1491	25.6%	1938	17.6%
	4+	1627	27.9%	2279	20.7%
	Price-Tier				
Rating	Budget	1033	17.7%	2069	18.8%
	Economy	1055	18.1%	1977	17.9%
	Midscale	1027	17.6%	1988	18.0%
	Upscale	1250	21.5%	2273	20.6%
	Luxury	1457	25.0%	2723	24.7%
Minimum Stay	<=80	1424	24.5%	4131	37.5%
	81–90	232	4.0%	661	6.0%
	91–95	542	9.3%	1231	11.2%
	96–100	3624	62.2%	5007	45.4%
	1	1678	28.8%	3161	28.7%
	2	2930	50.3%	3530	32.0%
	3–6	871	15.0%	2840	25.7%
	7+	343	5.9%	1499	13.6%

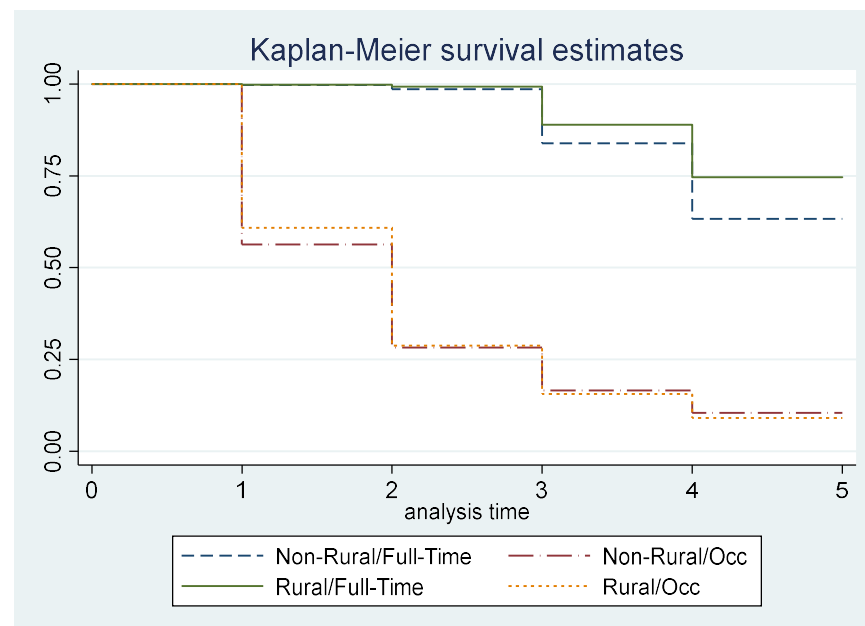
**Figure 1.** K–M survival estimates by location and STR type.

Table 3 provides the coefficient estimates and hazard ratios for all variables in the survival analysis. Based on the exponential baseline hazard function, we find that rural Short-Term Rentals (STRs) have a significantly higher survival probability of approximately

34.2%, compared to non-rural STRs, with a 5% significance level. This means that, when all other variables are held constant, rural STRs are more likely to remain active throughout the observation period than non-rural STRs. Moreover, Full-Time STRs exhibit a remarkably higher survival probability compared to Occasional STRs, with an approximate increase of 376%. The interaction term between Full-Time STRs and the rural location is also statistically significant. It reveals that Full-Time STRs in rural areas have a survival probability approximately 29.2% higher than that of Full-Time STRs in non-rural areas when controlling for other variables. As indicated in Table 2, rural areas have a higher proportion of Full-Time STRs. These findings suggest that although entry into the STR market may be less frequent in rural areas, once established, the likelihood of survival and continued operation is higher. These results shed light on the distinct characteristics of the rural market for Short-Term Rentals.

Table 3. Cox PH model coefficient estimates.

Variable		Coefficient		Hazard Ratio
Rural		−0.298	*	0.743
Full Time STR		−1.562	***	0.210
Rural × Full Time STR		−0.345	***	0.708
Bedroom (Ref. 0–1)				
	2	−0.012		0.988
	3	−0.051		0.950
	4+	−0.078		0.925
Rural × Bedroom				
	2	0.127		1.135
	3	0.253	***	1.288
	4+	0.177	**	1.195
Price-Tier (Ref. Budget)				
	Economy	−0.040		0.962
	Midscale	−0.069		0.933
	Upscale	−0.080	*	0.922
	Luxury	−0.306	***	0.736
Rural × PriceTier				
	Economy	0.092		1.096
	Midscale	0.108		1.113
	Upscale	0.089		1.093
	Luxury	0.296	***	1.343
Rating (Ref. ≤80)				
	81–90	−0.464	***	0.628
	91–95	−0.564	***	0.571
	96–100	−0.453	***	0.636
Rural × Rating				
	81–90	0.010		1.010
	91–95	−0.339	***	0.712
	96–100	−0.248	***	0.780
Minimum Stay (Ref. 1)				
	2	−0.116	**	0.890
	3–6	−0.238	***	0.788
	7+	−0.563	***	0.571
Rural × Minimum Stay				
	2	−0.177	**	0.837
	3–6	−0.110		0.895
	7+	−0.045		0.957
N		16,852		
LR chi2		8197.04		
Wald χ^2		Prob > chi2 = 0.0000		
County FE Control		Yes		

Notes: *, $p < 0.05$, **, $p < 0.01$, ***, $p < 0.001$.

The number of bedrooms does not significantly affect the survival probability of Short-Term Rentals (STRs) when considering all other variables. However, the interaction term between the rural location and the number of bedrooms demonstrates a statistically significant effect. For STRs with three bedrooms, the survival probability is 28.8% higher in rural areas compared to non-rural areas. Similarly, STRs with four or more bedrooms have a survival probability 19.5% higher in rural areas compared to non-rural areas. These findings highlight the importance of rural locations in influencing the relationship between the number of bedrooms and STR survival. When compared to the budget tier (reference category), STRs in the Economy, Midscale, and Upscale tiers showed slightly higher survival probabilities, although these effects were not statistically significant. However, the Luxury tier had a significantly higher survival probability. The interaction between the rural location and price tier was also explored. In rural areas, notably, the interaction effect was more pronounced for the Luxury tier, with a significantly lower survival probability for rural luxury STRs. The Luxury tier demonstrates a higher overall survival probability, but in rural areas, luxury STRs face a higher risk of dropout compared to their non-rural counterparts. When compared to the budget tier (reference category), STRs in the Economy, Midscale, and Upscale tiers exhibited survival probabilities that were slightly higher, although these differences were not statistically significant. The Luxury tier showed a significantly higher survival probability, with 26.4% increase compared to the budget tier. Luxury STRs in rural areas had a significantly lower survival probability, 26.7% lower than non-rural luxury STRs. When compared to the rating category of ≤ 80 (reference category), STRs in the 81–90, 91–95, and 96–100 rating categories show significantly higher survival probabilities. Specifically, STRs in the 81–90 rating category had a survival probability approximately 37.2% lower than the ≤ 80 rating category, while STRs in the 91–95 and 96–100 rating categories had survival probabilities 42.9% and 36.4% lower, respectively. The interaction between the rural location and rating indicates that higher-rated Short-Term Rentals (STRs) have a higher survival probability. In particular, for the 91–95 and 96–100 rating categories, there is a statistically significant increase in the survival probability for rural STRs compared to non-rural STRs.

Compared to the reference category of a 1-night minimum stay, STRs with a minimum stay of 3–6 nights and 7+ nights had a significantly higher survival probability. In rural areas, there was a slight increase in the survival probability for STRs with a minimum stay of two nights compared to non-rural areas. However, there was no significant difference in the survival probabilities for STRs with a minimum stay of 3–6 nights and 7+ nights between rural and non-rural areas. These findings hold important implications for the understanding of the short-term rental (STR) market. Firstly, the higher survival probability observed for rural STRs highlights the unique dynamics and characteristics of rural areas in sustaining and supporting the longevity of these accommodations. This suggests that rural areas provide a more stable and resilient environment for STR operations compared to non-rural areas.

Furthermore, the lack of significant impact from the number of bedrooms on STR survival probability indicates that factors other than the physical size of the accommodation play a more crucial role in determining the longevity of STRs. This emphasizes the importance of considering additional variables such as location, pricing, and rating when examining the survival dynamics of STRs. The significant interaction effects between the rural location and certain variables, such as price tier and rating, provide further insights. The lower survival probability observed for rural luxury STRs highlights the potential challenges and risks faced by high-end accommodations in rural areas. This suggests that while luxury STRs may generally exhibit higher survival probabilities, the rural context presents specific challenges that need to be considered by stakeholders in the market.

Overall, these findings shed light on the distinct characteristics of rural STR markets and underscore the importance of understanding the interplay between location and various factors in determining the survival of STRs. This knowledge can inform industry stakeholders, policymakers, and STR operators in making informed decisions and devel-

oping strategies to enhance the sustainability and success of their operations in both rural and non-rural areas.

6. Conclusions

This study focuses on the short-term rental (STR) market in Virginia, specifically examining the differences between rural and urban areas. Through our analysis, we contribute to the existing literature by conducting annual data analysis, categorizing STR units, conducting a comparative analysis between rural/small cities and urban areas, and utilizing survival analysis to gain insights into the factors associated with unit survival.

The findings of our study reveal several important insights. Firstly, the STR markets in both rural and non-rural areas of Virginia have experienced significant growth, even during the COVID-19 pandemic. The number of active listings has continued to increase, surpassing pre-pandemic levels. This indicates the resilience and popularity of the STR market in Virginia. The survival analysis conducted in our study highlights distinctive characteristics of the rural STR market. Rural STRs have a higher survival probability compared to non-rural STRs, indicating a more stable and sustainable environment in rural regions. These findings align with previous research that has emphasized the economic contribution and revitalization potential of STR platforms in rural areas [16,17]. Our study adds a novel perspective by focusing specifically on the survival mechanisms and unique features of the rural STR market. Our classification of STRs also provides a significant understanding of their impact on the housing market. We found that rural areas have a higher proportion of Full-Time STRs compared to non-rural areas, and these properties also exhibit higher survival probabilities. This suggests that a significant number of STR properties in rural regions are dedicated exclusively to short-term rentals throughout the year.

The results of this study have implications for stakeholders, policymakers, and STR operators. Understanding the interplay between location and various factors can inform decision-making and the development of strategies to enhance the sustainability and success of STR operations in both rural and non-rural areas. Moreover, the findings emphasize the need for effective regulations and policies that support the balanced growth of the STR market while addressing specific concerns within the local context. For instance, in rural areas, regulations might focus on managing the impact of Full-Time STRs on the local housing market. In rural areas, where Full-Time STRs are more prevalent, caution is needed when allowing STRs, as they may reduce the availability of housing units for long-term residents. Full-Time STRs essentially function as personal hotels. If they align with the housing needs of local residents in terms of location, size, and price, they can contribute to a decrease in housing inventory and worsen housing affordability. However, if these units cater to a different market segment than the local residents, utilizing them as STRs can benefit the rural economy. Recognizing these differences is vital when considering permits or regulations for STRs.

Additionally, policymakers can leverage the findings of this study to develop effective strategies for rural tourism development. The growth and success of rural STRs offers opportunities for diversifying tourism offerings, attracting visitors to non-traditional destinations, and supporting local economies. Strategies can include promoting rural tourism experiences, enhancing infrastructure and amenities, and fostering partnerships between STR operators, local businesses, and community organizations. Moreover, the identification of factors influencing STR survival, such as STR type, rating, and location, can guide policymakers in formulating targeted support programs and incentives. For example, initiatives that provide training and resources for hosts to improve the quality of their accommodations and ratings can contribute to the overall sustainability and competitiveness of the rural STR market. Overall, this research contributes to a comprehensive understanding of the rural STR market and its implications. The findings underscore the need for context-specific policies that balance the benefits and challenges associated with STRs, while leveraging their potential for rural revitalization and economic development.

Despite the valuable insights provided by our study, there are several limitations that suggest potential directions for future research. Central to our study was the comparison between rural and urban areas, and in the process, certain factors highlighted in prior research might not have received our full attention. For instance, competition between STRs and traditional lodging sectors, like hotels [32–38], the tourism industry growth [16,17], transportation accessibility [46], amenities of STRs [40], and market saturation levels [46] were not fully considered in the analytic model. In our analysis, these elements were controlled by county-level dummy variables, instead of examining them at the individual unit level. Another limitation is the geographical scope of our study. By focusing solely on Virginia, there is a limitation on how much we can generalize our findings to other regions or states. While Virginia offers a diverse landscape and can provide valuable insights, different regions come with their unique socio-economic dynamics, tourism trends, and regulatory frameworks.

Recommendations for future research include expanding the geographical scope beyond Virginia to better understand STR market dynamics across different regions. This expansion will help verify if our findings apply in different settings and under varied regulatory environments. There is also a need for more specific spatial analysis. Looking into factors like how close STRs are to major tourist attractions or natural areas could provide insights into why certain STRs are preferred or have better survival rates. A longitudinal or time-based analysis is also essential. By examining how the STR market responds over time to changes in regional economic conditions, tourism trends, and policy changes, we can gain deeper insights into its dynamics. Lastly, there is a clear need to dive deeper into the regulations affecting STRs. By moving beyond just county-level analysis to more localized regulations, we can obtain a clearer picture of how different rules and regulations impact STR survival.

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Appendix A

Table A1. County or County Equivalent in Virginia.

County or County Equivalent Name—Rural/Small City							
Accomack County	No	Giles County	Yes	Pittsylvania County	Yes	Danville city	Yes
Albemarle County	No	Gloucester County	No	Powhatan County	No	Emporia city	Yes
Alleghany County	Yes	Goochland County	Yes	Prince Edward County	Yes	Fairfax city	No
Amelia County	Yes	Grayson County	Yes	Prince George County	No	Falls Church city	No
Amherst County	Yes	Greene County	No	Prince William County	No	Franklin city	Yes
Appomattox County	Yes	Greensville County	Yes	Pulaski County	Yes	Fredericksburg city	Yes
Arlington County	No	Halifax County	Yes	Rappahannock County	Yes	Galax city	Yes
Augusta County	Yes	Hanover County	No	Richmond County	Yes	Hampton city	No
Bath County	Yes	Henrico County	No	Roanoke County	Yes	Harrisonburg city	Yes
Bedford County	Yes	Henry County	Yes	Rockbridge County	Yes	Hopewell city	No

Table A1. Cont.

County or County Equivalent Name—Rural/Small City							
Bland County	Yes	Highland County	Yes	Rockingham County	Yes	Lexington city	Yes
Botetourt County	Yes	Isle of Wight County	No	Russell County	Yes	Lynchburg city	Yes
Brunswick County	Yes	James City County	No	Scott County	Yes	Manassas city	No
Buchanan County	Yes	King and Queen County	Yes	Shenandoah County	Yes	Manassas Park city	No
Buckingham County	No	King George County	Yes	Smyth County	Yes	Martinsville city	Yes
Campbell County	Yes	King William County	Yes	Southampton County	Yes	Newport News city	No
Caroline County	Yes	Lancaster County	Yes	Spotsylvania County	Yes	Norfolk city	No
Carroll County	Yes	Lee County	Yes	Stafford County	Yes	Norton city	Yes
Charles City County	Yes	Loudoun County	No	Surry County	Yes	Petersburg city	No
Charlotte County	Yes	Louisa County	Yes	Sussex County	Yes	Poquoson city	No
Chesterfield County	No	Lunenburg County	Yes	Tazewell County	Yes	Portsmouth city	No
Clarke County	Yes	Madison County	Yes	Warren County	Yes	Radford city	Yes
Craig County	Yes	Mathews County	Yes	Washington County	Yes	Richmond city	No
Culpeper County	Yes	Mecklenburg County	Yes	Westmoreland County	Yes	Roanoke city	Yes
Cumberland County	Yes	Middlesex County	Yes	Wise County	Yes	Salem city	Yes
Dickenson County	Yes	Montgomery County	Yes	Wythe County	Yes	Staunton city	Yes
Dinwiddie County	No	Nelson County	No	York County	No	Suffolk city	No
Essex County	Yes	New Kent County	Yes	Alexandria city	No	Virginia Beach city	No
Fairfax County	No	Northampton County	No	Bristol city	Yes	Waynesboro city	Yes
Fauquier County	Yes	Northumberland County	Yes	Buena Vista city	Yes	Williamsburg city	No
Floyd County	Yes	Nottoway County	Yes	Charlottesville city	No	Winchester city	Yes
Fluvanna County	No	Orange County	Yes	Chesapeake city	No		
Franklin County	Yes	Page County	Yes	Colonial Heights city	No		
Frederick County	Yes	Patrick County	Yes	Covington city	Yes		

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